

## Base-Identity Effects in Runyankore Reduplication\*

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### 1 Introduction

The complicated verbal morphology of the Bantu verb has provided rich soil for investigation into the behavior of morphological and prosodic elements in phonology. During the past fifteen years, study into the nature of reduplication has included much work within the realm of Bantu verbal reduplication (Marantz 1982, Odden & Odden 1983, Mutaka & Hyman 1990, Downing 1994a, b). Much of the more recent work has been inspired by developments in the theory of phonology, including Optimality Theory (Prince & Smolensky 1993, McCarthy & Prince 1993) and Correspondence Theory (McCarthy & Prince 1995). This paper is an examination of the reduplication system of the Bantu language Runyankore<sup>1</sup>, which is spoken in the Ankole district of southern Uganda. It is closely related to Rukiga as well as to Runyoro, Rutoro, Haya and Kikerewe (see Odden 1996).

The focus of this discussion is the set of constraints on reduplication in Runyankore and how they interact to result in an incomplete copy of the verb stem. Of special interest is an asymmetry between the location of the causative morpheme [y] in the reduplicant (the copied or matching segments) and the underlying base (the source for the copying). As seen in (1), the causative lies in the pre-final position of the verb. Reduplication of a non-causative form in (2) illustrates the copying of segments from base into the reduplicant (underlined). The copying involves adjacent segments, [reeb], and the vowel [-a], which is required by the grammar. However, in the reduplicated form of a causative, the copying skips the segments [-ir-] in the reduplicant, as in (3).

- |     |              |                          |
|-----|--------------|--------------------------|
| (1) | oku-reeb-a   | 'to see'                 |
|     | oku-reeb-y-a | 'to betray' <sup>2</sup> |

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<sup>1</sup> All the data herein were elicited by me from Patrick Bamwine, a native speaker of Runyankore. I would like to thank him as well as David Odden and Beth Hume for their advice on this research. Thanks also to Frederick Parkinson for his feedback on this manuscript.

<sup>2</sup> While most causative/transitive forms are transparently related to the non-causative form, some are less obviously related.

- (2) a-reeb-ire 's/he saw'  
 a-reeba-reeb-ire 's/he saw over and over'
- (3) a-reeb-ize ← /a-reeb-ir-y-e/ 's/he betrayed' (hesternal<sup>3</sup>)  
 a-reebva-reeb-ize ← /a-RED-reeb-ir-y-e/ 's/he betrayed over and over'

The morpheme [y], located in pre-final position, interacts with the [r] of [-ire] to produce [z]. Thus, it is adjacent to the [r] in the surface base. However, the [y] appears next to the [b] of [reeb] in the reduplicant even though it is not adjacent to this segment in the surface base.

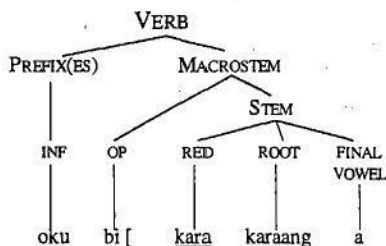
In this paper, I will provide an account of the main features of Runyankore reduplication in order to demonstrate the relationship that exists between the reduplicant (the copied segments) and the base (the segments that are copied from). I will demonstrate that a set of constraints on well-formedness (Prince & Smolensky 1993, McCarthy & Prince 1993, 1995) can predict the unusual copying of the causative morpheme into the reduplicant, despite surface discontinuities. As I will show, this analysis depends on the ordering of the causative morpheme with respect to the other morphemes of the verb in the input to the phonology. This ordering allows us to account for the asymmetry between the surface reduplicant and the base and the failure of the morpheme to appear in the reduplicant in some verbs.

This discussion is organized as follows: in Section 2, I provide a short description of reduplication in Runyankore. Section 3 examines how a set of ranked constraints might account for the properties of reduplication in this language. In Section 4, I review the segmental mutations that occur, and their interaction with reduplication in Section 5.

### 1.1 Theoretical Assumptions

In my discussion of the verb in Runyankore, I will use the following terms: root, stem, macrostem, base, and reduplicant. The verb in Bantu languages is classically analyzed in a hierarchical fashion. Of particular importance is the verb stem, which comprises the root, derivational morpheme (like the causative), the final vowel, and the reduplicant (see especially Hyman 1990 and Downing 1994a,b regarding reduplication). This structure is shown in (4). Another structure that plays a role in reduplication is the macrostem, which subsumes the stem and the object prefixes.

- (4) The hierarchical structure of the Bantu verb  
 oku-bi[kara-karaanga, 'to dry roast them, over and over'<sup>4</sup>



<sup>3</sup> The hesternal refers to actions that took place yesterday.

<sup>4</sup> Subscripted numbers after pronouns indicate the noun class to which the object pronoun refers.

- (5) a. oku[reeb-a]                               'to see'  
    oku[reeba-reeb-a]                     'to see ...'
- b. oku[sek-a]                                  'to laugh'  
    oku[seka-sek-a]                       'to laugh ...'
- c. oku[kwaat-a]                               'to touch'  
    oku[kwaata-kwaat-a]                 'to grope'

- |                           |                 |
|---------------------------|-----------------|
| d. oku[ <u>bagar</u> -a   | 'to weed'       |
| oku[ <u>baga</u> -bagar-a | 'to weed ...'   |
| e. oku[ <u>šohor</u> -a   | 'to go out'     |
| oku[ <u>šoha</u> -šohor-a | 'to go out ...' |

In forms of the verb with the perfective suffix [-ire]<sup>5</sup> (required by some past tenses and some moods, such as the hortative), the last consonant of the stem mutates before the vowel [i] of [-ire]. However, this effect is not copied to the reduplicant, where the last consonant remains faithful to the input. These are seen in (6), where an infinitive is contrasted with a verb form having the perfect suffix.

- |                               |                               |
|-------------------------------|-------------------------------|
| (6) a. oku[ <u>heek</u> -a    | 'to carry'                    |
| a-káá[ <u>heeč</u> -ire       | 'he should carry' (hortative) |
| a-káá[ <u>heeka</u> -heeč-ire | 'he should carry ...'         |
| b. oku[ <u>bar</u> -a         | 'to count'                    |
| a[ <u>baz</u> -íre            | 's/he counted'                |
| a[ <u>bará</u> -baz-ire       | 's/he counted ...'            |
| c. oku[ <u>huut</u> -a        | 'to drink from a bowl'        |
| a[húúts-ire                   | 's/he drank from a bowl'      |
| a[ <u>huutá</u> -huuts-ire    | 's/he drank from a bowl ...'  |
| d. oku[ <u>Jeend</u> -a       | 'to go'                       |
| a[ <u>jeenz</u> -íre          | 's/he went'                   |
| a[ <u>jeendá</u> -jeenz-íre   | 's/he went ...'               |
| e. oku[ <u>kwaat</u> -a       | 'to catch'                    |
| a[ <u>kwaats</u> -íre         | 's/he caught'                 |
| a[ <u>kwaatá</u> -kwaats-ire  | 's/he caught ...'             |

There is a further complication involving the affix [y], which marks the causative or the facultative (to VERB with). In general, the causative morpheme [y] occurs on the stem-final consonant, as shown in (7).

- |                           |                          |
|---------------------------|--------------------------|
| (7) a. oku[ <u>gab</u> -a | 'to divide'              |
| oku[ <u>gab</u> -y-a      | 'to divide with'         |
| b. oku[ <u>kam</u> -a     | 'to milk'                |
| oku[ <u>kam</u> -y-a      | 'to enable to give milk' |
| c. oku[ <u>rim</u> -a     | 'to cultivate'           |
| oku[ <u>rim</u> -y-a      | 'to cause to cultivate'  |
| d. oku[ <u>šutam</u> -a   | 'to sit'                 |
| oku[ <u>šutam</u> -y-a    | 'to cause to sit'        |

<sup>5</sup> The suffix [-ire] is one of three verbal affixes that causes a palatalization/spirantization effect in consonants (the other two are the causative [y] and the nominalizing suffix [i]). Historically, these all derive from the proto-Bantu superhigh vowel [i]. Not all occurrences of the vowel [i] in Runyankore result in palatalization/spirantization, however. Because of this, these morphemes probably have to be specially marked in the lexicon as invoking a particular constraint.

However, if the final consonant is a coronal or dorsal the morpheme [y] causes some type of consonant mutation: coronalization of dorsals, depalatalization of alveo-palatals, and spirantization of coronal stops, as shown in (8).

- (8) a. oku[gur-a  
oku[guz-a 'to buy'  
'to sell'
- b. oku[taah-a  
oku[taas-y-a 'to enter'  
'to bring in'
- c. oku[hik-a  
oku[hič-a (~ [-hitsya]) 'to arrive'  
'to cause to arrive'
- d. okw[óog-a  
okw[óoz-y-a 'to wash'  
'to wash (tr.)'

As noted above, this morpheme always appears just before the last vowel of the verb. Thus, we find that in the perfective, it mutates not the last consonant of the root (as in (8)), but the consonant [r] of the perfective suffix [-ir-]. Hence, the causative morpheme appears on the last consonant of the verb stem. The causatives forms in (9) contrast an infinitive, with the final vowel [-a], and a perfective (the hesternal tense), with the final morpheme [-ir-].

- (9) a. oku[róob-y-a  
a[róob-ize 'to wet down'  
's/he wet down'
- b. oku[hunam-y-a  
a[hunám-ize 'to quiet'  
's/he quieted'
- c. oku[reeb-y-a  
a[rééb-ize 'to betray'  
's/he betrayed'

The behavior of the reduplicant with respect to the causative morpheme is of particular interest because the causative morpheme or its effects appear in the reduplicant, as well as in the base, as illustrated in (10).

- |         |                              |  |                          |
|---------|------------------------------|--|--------------------------|
| (10) a. | oku[hika                     |  | 'to arrive'              |
|         | oku[hiča                     |  | 'to cause to arrive'     |
|         | oku[ <u>hiča</u> -hiča       |  | 'to cause to arrive ...' |
| b.      | oku[taaha                    |  | 'to enter'               |
|         | oku[taas-y-a                 |  | 'to bring in'            |
|         | oku[ <u>taasya</u> -taas-y-a |  | 'to bring in ...'        |
| c.      | okw[óoga                     |  | 'to wash'                |
|         | okw[óoz-y-a                  |  | 'to wash (tr.)'          |
|         | okw[óózya-vooz-y-a           |  | 'to wash ... (tr.)'      |

However, as shown in (11), the spirantizing/palatalizing effects of the affix [-ire] are not copied to the reduplicant.

- (11) a. okw[óoga 'to bathe'  
a[yoj]-íre 's/he bathed'  
a[yoga-yoj]-íre 's/he bathed ...'

- |                    |                                    |
|--------------------|------------------------------------|
| b. oku[čúunda      | 'to churn'                         |
| a[čúunz-íre        | 's/he churned'                     |
| a[čúunda-čúunz-íre | 's/he churned ...'                 |
| c. oku[mera        | 'to germinate'                     |
| bi[mez-íre         | 'they <sub>s</sub> germinated'     |
| bi[merá-mez-íre    | 'they <sub>s</sub> germinated ...' |

Recall from (9), that the causative [y] always appears just after the last consonant of the word. Because this effectively shifts the causative [y] away from the edge of the first CVC of the base, one expects no palatalization or spirantization in the reduplicant. However, as the following reduplicated forms demonstrate, even if the causative [y] is no longer adjacent to the copied CVC from the base (because it has shifted to pre-final position), its presence or effects as still found in the reduplicant.

- |                             |                             |
|-----------------------------|-----------------------------|
| (12) a. oku[bara            | 'to count'                  |
| oku[baza                    | 'to cause to count'         |
| a[bazá-bar-ize ← bar-ir-y-e | 's/he caused to count'      |
| b. a[hič-íre                | 's/he arrived'              |
| a[hiká-hič-íre              | 's/he arrived ...'          |
| a[hicá-hič-ize              | 's/he caused to arrive ...' |
| c. oku[guza ← gur+y+a       | 'to sell' ('cause to buy')  |
| a[gur-ize                   | 's/he sold'                 |
| a[guzá-gur-ize              | 's/he sold ...'             |

The reduplicant copies the [y] of the causative morpheme, even though it is no longer contiguous with the other copied segments in the base.

The main problems to be accounted for in this discussion relate to the reduplication pattern and the asymmetry between the perfective and the causative and their respective effects on the reduplicant and base. Once the principles governing reduplication have been introduced, an account of the interaction of reduplication and segmental phonology will be undertaken. The copying of segmental features into the reduplicant from the base will be shown to be a consequence of the hierarchy of constraints responsible for copying of segments and features.

## 2.1 Reduplication and the Stem

The data presented thus far suggest that the reduplicated material is taken from the left edge of the stem and is prefixed to the base. However, I have assumed thus far that the reduplicant is infixed into the stem—it is in the stem. In other words, the left edge of the reduplicant and the left edge of the stem coincide (see McCarthy & Prince 1993 for a further discussion of alignment). Below I provide independent evidence from the placement of tones in the language that argues for an analysis that includes the reduplicant in the stem.

### 2.1.1 The Stem as a Tonal Domain

The data in (13) show reduplication of high-toned verbs. The lexical high<sub>L</sub> tone stays at the left edge of the stem. A morphological constraint on tonal association compels a lexical high tone to align to the left edge of the stem.

- |                  |                        |
|------------------|------------------------|
| (13) a. oku[šára | *to cut'               |
| oku[šára-šara    | *to cut over and over' |

- |                   |                              |
|-------------------|------------------------------|
| b. oku[rúma       | 'to bite'                    |
| oku[rúma-ruma     | 'to bite over and over'      |
| c. oku[káraanga   | 'to dry roast'               |
| oku[kára-karaanga | 'to dry roast over and over' |

Another principle of tone assignment (one that is morphologically conditioned) requires toneless verbs to have a high tone on the syllable that contains the second mora of the stem<sup>6</sup> in certain verb tenses: the V2 pattern. As the habitual forms in (14) demonstrate, the high tone of the habitual stays on the V2 syllable in both plain and reduplicated forms of the verb.

- |                |                 |                    |                     |
|----------------|-----------------|--------------------|---------------------|
| (14) a[bazfira | 's/he sews'     | a[bazá-baziira     | 's/he sews ...'     |
| a[šohóra       | 's/he goes out' | a[šohá-šohora      | 's/he goes out ...' |
| a[haandíika    | 's/he writes'   | a[haandá-haandiika | 's/he writes ...'   |
| a[guṛúka       | 's/he jumps'    | a[guṛá-guruka      | 's/he jumps ...'    |
| a[ramútsya     | 's/he greets'   | a[ramá-ramutsya    | 's/he greets ...'   |
| a[jeénda       | 's/he goes'     | a[jeendá-jeenda    | 's/he goes ...'     |

The domain of these tonal principles is the stem as defined in (4) above (see also Poletto 1996). In order to consistently predict the location of this high tone, the reduplicant must be counted as part of the stem. Therefore, as shown by the tonal evidence in (13) and (14), the reduplicant forms part of the morphological stem.

### 2.1.2 Monosyllabic Roots and the Stem

The reduplicant is not simply a copy of segments from the stem but must also satisfy a requirement of minimal size. The reduplicant must be two syllables long, adhering to a binarity constraint. If the stem is at least two syllables in length, then the reduplicant will be disyllabic. However, if the base for reduplication, the input stem, is too short, there may not be sufficient segmental material to create a binary reduplicant. If the base contains a glide, as in (15), then reduplication may take place. The glide is moraic in the input and can contribute a mora to the reduplicant, allowing it to be binary (two morae). However, if the base does not contain a glide, then a binary reduplication cannot be created, as seen in (16).

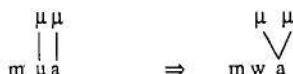
- |                         |                       |
|-------------------------|-----------------------|
| (15) a. oku[mwa         | 'to shave'            |
| oku[mwaa-mwa            | 'to shave ...'        |
| b. nibá[rya             | 'they are eating'     |
| niba[ryáá-rya           | 'they are eating ...' |
| (16) a. okú[fa          | 'to die'              |
| *oku[fá-fa, *oku[fáa-fa | 'to die ...'          |
| b. oku[za               | 'to go to'            |
| *oku[zá-za, *oku[zaa-za | 'to go out ...'       |
| c. oku[sa               | 'to grind'            |
| *oku[sá-sa, *oku[saa-sa | 'to grind ...'        |

<sup>6</sup> If this mora is in either position of a long penult, the result is a falling tone.

<sup>7</sup> Two details must be noted: (1) coda nasal consonants are not counted in calculating V2, even though they lengthen a preceding vowel and (2) a high tone retracts from a final syllable, owing to phrase-final position.

Note that in these example, we might expect the final vowel of the verb to be long, because of glide formation and compensatory lengthening, illustrated in (17). However, long vowels never appear at the edge of the word (see Odden, this volume, for discussion of a similar phenomenon in Kikereve). This appears to be a high ranked constraint in the language. But, because the reduplicant is word-internal, glide formation and compensatory lengthening will produce a long vowel and thus satisfy the binarity requirement.

(17) Glide Formation and Compensatory Lengthening



One strategy that the language uses to satisfy the binarity requirement on reduplicants is to recruit the object prefix into the reduplicant, as in (18).

- |         |                  |                                |
|---------|------------------|--------------------------------|
| (18) a. | oku[sa           | 'to grind'                     |
|         | oku-bú[sa        | 'to grind it <sub>4</sub> '    |
|         | náá-bú[sa-busa   | 'to grind it <sub>4</sub> ...' |
| b.      | okú-rya          | 'to eat'                       |
|         | oku-bú[rya       | 'to eat it <sub>4</sub> '      |
|         | oku-bú[rya-burya | 'to eat it <sub>4</sub> ...'   |
| c.      | okú[nwa          | 'to drink'                     |
|         | oku-gá[nwa       | 'to drink it <sub>6</sub> '    |
|         | oku-gá[nwa-ganwa | 'to drink it <sub>6</sub> ...' |

Here, the base is defined in terms of the macrostem, which includes the object prefix. The fact that the object prefix segments appear on the right as well suggests that the reduplicant is suffixed in these cases. However, this fact can be analyzed as a means to satisfy the requirements on reduplicant and verb well-formedness.

### 3 A Ranked Constraints Approach to Reduplication

This account of the reduplication of Runyankore verbs will use a set of ranked constraints to evaluate the well-formedness of surface forms (Prince & Smolensky 1993). Following McCarthy & Prince (1995), I will also assume that there is a set of constraints on faithfulness between input and output. A family of surface-to-surface faithfulness constraints is crucial for an analysis of reduplication as well. These constraints ensure that the reduplicant, which is phonologically empty in the input, contains segments that are phonologically similar to (subject to other constraints on well-formedness) the base on the surface or the input to the base (reduplicant-base faithfulness and input-reduplicant faithfulness, respectively).

As we saw in section 2, the reduplicant is always binary at some level of analysis—disyllabic or bimoraic. Following Downing (1993), the constraints on the length of the reduplicant are that it must be a foot and that feet are binary.

- |      |   |        |
|------|---|--------|
| (19) | The reduplicant must be a foot                  | RED=FT |
| (20) | Feet must be binary (at some level of analysis) | FTBIN  |

Along with the constraint on binarity of feet, FTBIN (Prince & Smolensky, 1993), RED=FOOT requires only binary reduplicants to surface. The location of the reduplicant is



specified by constraints that require it to prefix to the stem-base and to be anchored to the left edge of the stem-base. Specifically, the reduplicant must be anchored to the left edge of the stem.

- (21) **ALIGN(RED, LEFT, STEM, LEFT)** ALIGN-L  
Align the left edge of any reduplicant with the left edge of some stem.
- (22) **LEFT-ANCHOR(RED, BASE)** ANCH-L  
The reduplicant should be anchored to the left edge of the base.

ALIGN-L requires the left edge of the reduplicant to align with the left edge of the stem. The result is that the reduplicant is always included in the stem (as shown by tonal assignment). The anchoring constraint ANCH-L requires the reduplicant to anchor to the left edge of the base. Since the reduplicant is also part of the stem, the reduplicant will be anchored not with the stem on the surface but with the base, which is defined in terms of the input stem or macrostem. Because the reduplicant is phonologically empty, there is no segmental material to be copied. Thus, the segmental material at the left edge of the base coincides with the segments at the left edge of the verb root, which is the leftmost morpheme in the stem. This ensures that the reduplicant can be included in the stem on the surface. The fact that the segments copied are also part of the stem supports the correspondence relationship between the input stem and the output reduplicant. The reference to the input base in the ANCH-L constraint avoids the problem of a circular reference to segments in the reduplicative morpheme when evaluating its anchoring—the result if anchoring also referred to the left edge of the stem on the surface.

The constraints on reduplicant well-formedness must outrank the constraints that would require total copying of all elements in the base to the reduplicant:

- (23) **MAX-BASE REDUPPLICANT** MAX-BR

The MAX-BR (McCarthy and Prince 1995) constraint requires every segment in the base to also appear in the reduplicant. However, if the base is longer than a foot the entire base cannot be copied into the reduplicant. In such a case, only the segments necessary to satisfy FTBIN and RED=FT are copied in the reduplicant. Thus, the following ranking must hold.

- (24) **RED=FT, FTBIN, ALIGN-L, ANCH-L >> MAX-BR**

This ranking is demonstrated in the following tableau. The curly braces “{ }” represent the boundaries of a foot (which I will mark when necessary for clarity). I will be assuming that the word is not exhaustively footed and the lack of curly braces indicates that the reduplicant is not footed (violating RED=FT, but not FTBIN).

Tableau 1 oku + káraang + a + RED ‘to dry roast ...’

	RED=FT	FTBIN	ALIGN-L	ANCH-L	MAX-BR
a. oku{[kára]-karaanga					aanga
b. oku[ká-karaanga	*!				raanga
c. oku{[káraanga]-karaanga		*!			
d. oku[ká-{kara}-raanga			*!		aanga
e. oku{[ráanga]-karaanga				*!	ka

Candidate (a) succeeds because it satisfies all the constraints on reduplicant well-formedness. Runyankore is very strict regarding the formation of reduplicants and will only admit a few exceptions. Candidate (b) fails because the reduplicant is not a foot.

Candidate (c) fails because the foot constructed over the reduplicant is not binary. Candidate (d) fails because the reduplicant is misaligned with respect to the left edge of the stem. Finally, candidate (e) fails because the reduplicant is not anchored with the left edge of the base, [karaanga].

Consider, the following reduplications where the base is longer than two syllables. Reduplication fails to copy the vowel of the second syllable of the base. The sound [a] is substituted in its place.

- |      |                                  |                  |
|------|----------------------------------|------------------|
| (25) | oku[ <u>rama</u> -ramutsya       | 'to greet ...'   |
|      | oku[ <u>reemba</u> -reembesereza | 'to comfort ...' |
|      | oku[ <u>šoha</u> -šohora         | 'to go out ...'  |

The last vowel of the reduplicant is not copied from the base (as is suggested in Tableau 1—only the first CVC or CVVC is copied from the base. A separate constraint requires the reduplicant to end in the vowel [a], regardless of the vowel in the input base. What would compel this requirement? Downing (1993) argues that reduplicants in Kikuyu and KiNande also end in the vowel [a] because the reduplicant must be a "Canonical Stem" (cf. Peng 1992) defined by Downing as follows:

1. Prosodic constraint: Must be a syllabic trochee.
2. Morphological constraint: Must look like a verb stem by ending with Final Vowel /-a/.

One potential difficulty with this understanding of reduplication lies in identifying what a canonical stem is. Generally, the stem is considered to be the verb root, derivational affixes (such as [-ir-] 'for' and [-an-] 'each other') and a final vowel which contributes information about the mood and tense of the verb. For example, in most indicative present tenses, the final vowel is [a]. However, in the subjunctive, the final vowel is [-e]. In fact, the terminology "final vowel" might be an unfortunate misnomer because the perfective morpheme, [-ire], occupies the same space as the final vowels [-a] and [-e]. Perhaps "final morpheme" would be a better choice. But, "final vowel" is accepted in the literature on Bantu morphology and phonology and I will retain it for tradition, if not for perspicacity.

- |      |                              |                              |
|------|------------------------------|------------------------------|
| (26) | akáá[ <u>heeka</u> -heeč-ire | 'he should carry ...'        |
|      | a[ <u>bará</u> -baz-ire      | 's/he counted ...'           |
|      | a[ <u>huutá</u> -huuts-ire   | 's/he drank from a bowl ...' |
|      | a[ <u>jeendá</u> -jeenz-ire  | 's/he went ...'              |

As the words in (26) show, the final vowel of the reduplicant is invariably [a] and cannot have its origins linked to the surface final vowel (final morpheme).

When Downing was writing these analyses of Bantu reduplication, OT did not have at its disposal the families of faithfulness constraints collectively referred to as *Correspondence Theory* (CP, McCarthy & Prince, 1995). In a way, Downing's account requires a relationship between the surface reduplicant and some other idealized stem, the canonical stem. Constraints in the correspondence family might provide a means to evaluate the similarity between the reduplicant and a canonical stem. However, the correspondence constraints refer to specific elements in the language (both on the surface and underlying). Using correspondence constraints to compel the insertion of the vowel [a] at the end of a reduplicant requires the introduction of another notion into the grammar—the canonical stem. Of course, there are many stems in the realm of grammatical verb forms that correspond to a grammatical stem. But, referring to them as a class would still require positing a canonical stem first.

The notion of canonical stem seems to be derived from the statistical preponderance of verb stems that have the form [CVCa]. However, the only purpose a constraint requiring the reduplicant to be a canonical stem serves is to ensure that it ends in the vowel [a]. The constraints RED=FT and FTBIN enforce size requirements that are also true of canonical stems. Thus far, analyses of Runyankore verbal system do not require any other reference to the canonical stem. Is the canonical stem a necessary concept? At this point, rather than appealing to the notion of canonical stem, I will simply use a constraint that requires the last vowel of the reduplicant to be [a]:

- (27) ALIGN(RED, RIGHT; [a], RIGHT) REDFV  
Align the right edge of a reduplicant with the right edge of the vowel [a].

Because the vowel [a] appears in the reduplicant without a correspondent in the input or in the base, we know that the REDFV constraint must outrank a constraint penalizing the insertion of a segment into the reduplicant that is not in the base: DEP-BR.

- (28) A segment in the reduplicant must have a corresponding segment in the base: DEP-BR

Tableau 2 oku[šohora + RED 'to go out ...'

	REDFV	FTBIN	ALIGN-L	ANCH-L	MAX-BR	DEP-BR
a. oku[šoha]-šohora					-ora	-a
b. oku[šoho]-šohora	*!				-ra	
c. oku[šohra]-šohora				*!	šo-	

Candidate (b) fails because the reduplicant does not end in the vowel [a], violating REDFV. Candidate (a) succeeds despite a DEP-BR violation—the insertion of the vowel [a] into the reduplicant. This is necessary to satisfy the REDFV constraint. This approach sees the segment [a] as not corresponding to any segment in the base—it is inserted by GEN. Because it is inserted and not licensed by a base-reduplicant identity relationship, it violates DEP-BR. Recall that there is no segmental content to the reduplicant morpheme RED. So, any candidate has some number of DEP-IR violations (perhaps analogous to a \*STRUC violation under pre-CT Optimality). One could alternatively view this as a violation of IDENT-FEATURE-BR. Under this interpretation, the faithfulness coindexing between the reduplicant and the base would include a reference between the last vowel of the reduplicant and the fourth (in this case) segment of the base, [o]. However, we will reject this approach because the last vowel of the reduplicant is clearly not supplied by the base—it is invariably [a], regardless of the "corresponding" (i.e., positionally equivalent) vowel in the base. Recalling Downing's analysis of reduplication, the [a] is present because of the requirement that the reduplicant be a canonical stem. Under this account there is further support for the argument that the vowel [a] is independently inserted. Thus, we could imagine a tableau like the following.

Tableau 3 oku[šohora + RED 'to go out ...'

	REDFV	DEP-BR
a. oku[šoha]-šohora		*
b. oku[šoho]-šohora	*!	
c. oku[šohra]-šohora	*!	*
d. oku[šohi]-šohora	*!	*
e. oku[šohu]-šohora	*!	*

Candidate (b) does not violate DEP-BR because every segment in the reduplicant has a correspondent in the base (assuming at this point that the base is the remainder of the stem). Candidates (c)–(e) all incur violations of DEP-BR, just as candidate (a) does. However, like candidate (b), they fatally violate REDFV.

In the case of a long verb, such as [oku-reembesereza], 'to comfort', several segments from the base are not copied in the reduplicant. This results in some number of MAX-BR violations. However, the constraints on reduplicant form outrank MAX-BR.

Tableau 4 oku[reembesereza + RED 'to comfort ...'

	FTBIN	RED=Ft	MAX-BR
a. oku[reemba]-reembesereza			esereza
b. oku[reembe]sa-reembesereza		*!	ereza
c. oku[reembesa]-reembesereza	*!		ereza

The more that a candidate satisfies MAX-BR the worse it does with respect to RED=Ft and/or FTBIN. This is further evidence for ranking the reduplicant form constraints above MAX-BR.

Because the constraints on reduplicant form appear not to be ranked with respect to one another, I will collapse them into more general statement for the purposes of simplicity.

$$(29) \text{ RED=Ft, FTBIN, REDFV, ALIGN-L, ANCHOR-L} \Leftrightarrow \text{RED FORM}^*$$

RED FORM is not a constraint in itself, but a shorthand for a group of related constraints that rank together in this language, and define the well-formed, properly anchored and aligned reduplicant. With this shorthand, Tableau 2 appears as follows:

Tableau 2' oku[šohora + RED 'to go out ...'

	RED FORM	MAX-BR	DEP-BR
a. oku[šoha]-šohora		-ora	-a
b. oku[šoho]-šohora	*!	-ra	
c. oku[šhora]-šohora	*!	šo-	

### 3.1 Vowel-Initial Stems

Vowel-initial stems also undergo reduplication. The form of the reduplicant is dependent upon the length of the base. If the base is VCV, as in (30), then there is copying with the insertion of a [y] to avoid hiatus between the reduplicant and the base and/or between vowels, as in (30).

- (30) okw[éga]-yega 'to learn ...'  
 okw[aara]-yara 'to spread out ...'  
 okw[ootsya]-yootsya 'to burn ...'  
 okw[íba]-yiba 'to steal ...'

\* I will indicate an abbreviation of a number of constraints by italicizing it.

- (31) a[yega-ye]íre                    's/he learned ...'  
       a[yeta-yets]íre                's/he called ...'  
       a[yita-yits]íre                's/he killed ...'

In (30), the glide [y] separates the final [a] of the reduplicant from the initial [e] of the base. Observe that the epenthetic [y] is not copied into the reduplicant: \*[oku[yéga-yega]]. In (31), a glide appears both between the reduplicant and the base and between the reduplicant and the subject prefix [a-]. This is evidence that the ONSET constraint is ranked above the constraint against inserting segments, DEP. Furthermore, MAX-BR would tend to enforce copying of the epenthetic segment from the base into the reduplicant. However, this is not the case. I suggest that input-reduplicant faithfulness is more highly ranked and, therefore, preserves the similarity between the input and reduplicant over the need to make the reduplicant resemble the surface form of the base, as required by MAX-BR.

To satisfy the REDFORM constraints, anchoring must be violated. This is evidence that ANCH-L lies below REDFORM in the constraint hierarchy. The words in (30) have two ANCH-L violations. Recall from above that the anchoring constraint here applies between the input base and the surface form. The [y] is inserted between the reduplicant and the rest of the base in the output in order to avoid an ONSET violation.

- (32) Input:                                oku - { RED - ég - a }<sub>stem</sub>  
       ↓  
       Output:                              okw [ ééga - yega

Here the segments marked as 'base' are what the anchoring constraint refers to—they are not thus marked in the input. Because RED is phonologically empty, the segment at the very left edge of the input is the vowel [e]. Thus, even though there is a [y] present on the surface at the left edge of the remainder of the base (minus the reduplicant) its epenthetic nature prevents it from being copied into the reduplicant to satisfy ANCH-L. The words in (31) have the glide present at the left edge of both the reduplicant and the base. In this instance, this glide appears in both locations to satisfy ONSET. The satisfaction of ANCH-L as well as base-reduplicant identity constraints is serendipitous.

Tableau 5 illustrates the evaluation of a vowel-initial stem. Because REDFORM does not outrank the ANCH-L constraint, candidate (a) will be superior to candidate (b), which has a prosodically well-formed but a misanchored reduplicant. Finally, candidate (c) fails because it incurs an ONS violation between the reduplicant and the base.

Tableau 5      oku - RED - ég - a      'to learn ...'

	ONS	REDFORM	IR-FAITH	MAX-BR	DEP-BR
a. okw[ <u>ééga</u> -yega]					
b. o[kw <u>ééga</u> -yéega]		**!	*		
c. okw[ <u>ééga</u> -ega]	*!	*			

In most cases, if the base is long, the initial vowel continues to be considered part of the stem, as in (33).

- (33) a. okw[iiga-yigura]                'to open ...'  
       a[yigá-yigura]                    's/he opens ...'  
       b. okw[ooora-yoreka]            'to show ...'  
       a-[yora-yorečíre]                's/he showed ...'

However, in some cases, the initial vowel is excluded, as in (34).

- (34) ay-ee[yama-yamwiire 's/he yawned ...'  
 ay-ee[šerá-šerečire 's/he hid ...'  
 okw-ee[šonga-šongora 'to sing ...'  
 a-ye[šonga-šongoire 's/he sang ...'

In all of these cases, the vowel in question is [e]. These forms can be analyzed as involving the reflexive prefix [e]. This would explain why the vowel is not included in reduplication.

### 3.2 Monosyllabic Roots

Consider again the monosyllabic roots that have no reduplicated form, repeated from (16) in (35). They have no means to satisfy the binarity requirement.

- (35) a. okú[fa 'to die'  
 \*oku[fá-fa, \*oku[fáa-fa 'to die ...'  
 b. oku[za 'to go to'  
 \*oku[za-za, \*oku[zaa-za 'to go out ...'  
 c. oku[sa 'to grind'  
 \*oku[sa-sa, \*oku[saa-sa 'to grind ...'

Thus, no parse of the forms in (35) can be considered grammatical—there just is no reduplicated form of this verb. In order to account for this, the grammatical model must have a means to rule out a particular parse. This problem remains an area for further research.

On the other hand, the monosyllabic roots in (36) are able to satisfy the minimality constraint because the resulting reduplicant is bimoraic owing to the underlying presence of a vowel in the root, which contributes a mora, along with the inserted vowel [a].

- (36) a. oku[mwa 'to shave'  
 oku[mwaa-mwa 'to shave ...'  
 b. nibá[rya 'they are eating'  
 niba[ryáa-rya 'they are eating ...'

There is another means by which the minimality constraint FTBIN can be satisfied in monosyllabic roots lacking an underlying vowel—an object prefix can be 'recruited' into the reduplicant, as in (37) (repeated from (18)). If an object prefix is present, it appears twice—in the reduplicant and before the base. The words in (37b-c) also suggest that object prefix incorporation is the preferred strategy, even if the verb root is bimoraic.

- (37) a. oku[sa 'to grind'  
 oku-bú[sa 'to grind it<sub>14</sub>'  
 oku-bú[sa-busa 'to grind it<sub>14</sub> ...'  
 b. okú[rya 'to eat'  
 oku-bú[rya 'to eat it<sub>14</sub>'  
 oku-bú[rya-burya 'to eat it<sub>14</sub> ...'  
 c. okú[nwa 'to drink'  
 oku-gá[nwa 'to drink it<sub>6</sub>'  
 oku-gá[nwa-ganwa 'to drink it<sub>6</sub> ...'

Notice also that the prefixal segments of [oku-] cannot be recruited to satisfy the requirement of binarity (compare (37) and (35)). Only the object prefixes can be included in the reduplicant. Why should this be? Unlike the prefix [oku-], the object prefixes (including the reflexive object prefix [-e-]) are part of a larger constituent in the verb—the macrostem, which comprises the stem proper as well as the object prefixes and the reflexive prefix. The failure of certain monosyllabic roots to reduplicate and the complexities of prefix incorporation are necessary for a full account of reduplication in Runyankore. However, they are currently beyond the scope of this paper and are the focus of ongoing research.

#### 4 Consonantal Phonology and Reduplication

In this section, I will present three types of segmental interaction in Runyankore—coronalization, spirantization and dissimilation, all caused by the causative morpheme, [y], and the perfective suffix, [-ire]. The consonants of Runyankore are provided in (38).

##### (38) Runyankore Consonants

Labial	Coronal	Alveo-palatal	Dorsal	Glottal
p b	t d*		k g	h
f v	s z	ʃ ʒ		
		ç ʝ*		
m	n	ɲ	ŋ*	

\*These sounds appear to be present only on the surface.

The sounds [r], [d] and [z] are surface variants of one another. The glide [r] appears in intervocalic position: [oku-rima] 'to cultivate'. The voiced stop [d] appears in post-nasal position: [oku-n-dim-ir-a] 'to cultivate for me'. The sounds [d] and [r] alternate with [z] before the vowel [i] in certain affixes, shown below. The sound [j] appears to be an allophone of [g], appearing before front vowels. There are five vowels [a e i o u] with [e] and [i] being closer to [ɛ] and [ɪ].

##### 4.1.1 Consonant Mutations in the Causative and Perfective

A number of consonantal alternations take place in Runyankore. Most of these are a species of coronalization (see e.g., Hume 1994) or spirantization. Generally they occur before the high front vowel [i] and result in palatalization, or before the causative morpheme [y] and result in coronalization (with [-anterior]) of the consonant. However, in some cases, the consonant undergoing the change is already a coronal. In those cases, the result is usually a type of frication/affrication.

##### (39) Consonant mutations induced by the vowel [i] in the morpheme [-ire]

a.	t → ts <sup>9</sup>	a[h]uut	+	ire	→	a[húúts-ire	'he slurped (yest.)'
b.	r → z	a[bar	+	ire	→	a[baz-ire	'he counted'
c.	ʃ → s	a[héēs	+	ire	→	a[hées-ire	'he forged (metal)'
d.	ʒ → z	a[beiz	+	ire	→	a[béiz-ire	'he carved'
e.	k → ç	a[héek	+	ire	→	a[hééç-ire	'he carried'
f.	g → j	a[híing	+	ire	→	a[híinj-ire	'he cultivated'
		3s[ROOT	+	PERFECTIVE			

<sup>9</sup> This segment frequently is also pronounced as [s]. This alternation is probably socio-linguistically influenced. The closely related language Rukiga is recorded to make use of this sound before [i].

In fact, the data in (39) represent three different consonant mutations. The first is a morpho-phonologically conditioned spirantization of a coronal sound ([ts] and [z]). The second involves the loss of a [-anterior] feature because of an OCP violation involving the vowel [i] ([s] and [z]). Finally, we see an example of coronalization in which a dorsal sound becomes alveo-palatal before [i]. The first two sounds in questions may seem to be less like a natural class until one considers the fact that [r] and [d] are positional variants of each other ([d] only appears after a stop and alternates with [z] in the same way that [r] does).

The causative morpheme [y] causes slightly different effects. As the forms in (40) show, the coronals [t] and [z] spirantize. However, the glide [y] of the causative is lost. On the other hand, the dorsals [k] and [g] become [-anterior] coronals, with the preservation of the glide.

(40) Consonant mutations induced by the causative

a.	t → ts	oku[haata + y	→	oku[haatsa	'to cause to peel'
b.	r → z	oku[bara + y	→	oku[baza	'to cause to count'
c.	k → tsy	oku[hika + y	→	oku[hitsya	'to cause to arrive'
d.	g → zy	okw[ooga + y	→	ok[woozya	'to wash (tr.)'
		INFINITIVE + CAUSATIVE			

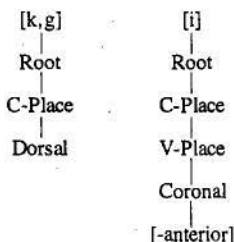
The coronals [t] and [r] spirantize as with [-ire]. However, the dorsal sounds [k] and [g] become palatalized coronals. The sounds [š], [ž], and [č] do not participate in this process because of suppletive principles that substitute the alternative causative affix [-is-].

- (41) oku[beiz-is-a 'to cause to carve'  
 oku[raaš-is-a 'to cause to shout'  
 oku[čac-is-a 'to cause to mince'

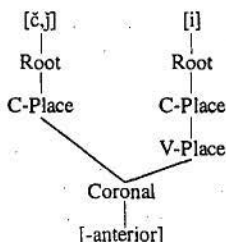
When a dorsal sound, [k] or [g], is followed by [-ire], the [-anterior] value of the vowel [i] must be shared by the consonant. This is accomplished via the linking of the vocalic [Coronal, -anterior] features to the place node of the velar, replacing it. The resulting sound is an alveo-palatal [č] or [j].

(42) Coronalization of Dorsals

Input:



Output:



The constraint that requires this output configuration (the shared V-Place Coronal node) will be referred to as CORONALIZE.

(43) CORONALIZE

A dorsal sound in the input that is adjacent to a front vowel must share the Coronal place with the vowel on the surface.



Unlike coronalization, which is widespread and regular throughout Runyankore, the spirantization of [r] and [t] is conditioned only by a small set of morphemes. These morphemes are the causative [y], the perfective suffix [-ire], and the nominalizing suffix [-i] (e.g., *ɔkor* 'work', [omu-koz-i] 'worker'). Historically, all three had the superhigh vowel \*i. Runyankore no longer contrasts the superhigh vowels, \*i and \*y from the high vowels (i.e., they have merged to [i] and [u], respectively). However, the spirantizing effects of the superhigh vowels persist in Runyankore. Because the high front vowel [i] in these three spirantizing affixes is the same as a nonspirantizing [i], we must resort to a morpho-phonological constraint that requires these sounds to surface as affricates or fricatives when followed by the vowel [i] in one of these morphemes. The constraint responsible for this is given in (44).

(44) SPIRANTIZE

An Coronal, [+anterior] sound in the input should be pronounced as an affricate or fricative when followed by [y] causative, [-ire] perfective, or [-i] agentive.<sup>10</sup>

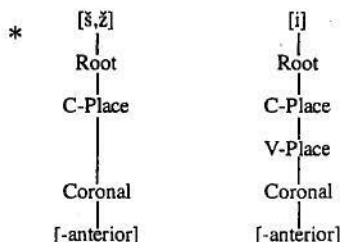
The coronal sounds [t] and [r] both spirantize. The alveopalatal fricatives [ʃ] and [ʒ] become [s] and [z], which will be analyzed as a form of the OCP applying to the feature [-anterior]. The dorsal sounds [k] and [g] become alveopalatal fricatives—a process analyzed as a sharing (or spreading) of the vocalic place of the vowel [i]. In order for the effect of this constraint to appear, the SPIRANTIZE constraint must outrank the constraint requiring input-output identity, IO-IDENT. Furthermore, because the glide [y] is lost when the causative is the conditioning morpheme, the SPIRANTIZE constraint must be understood to force the deletion of a glide in this context, violating MAX.

Tableau 6 oku [ bar - y - a 'to cause to count'

	SPIRANTIZE	MAX
a. oku[baza]		*
b. oku[bazyā]	*	
c. oku[barya]	*	

Finally, let us consider the alternation of [ʃ] with [s] and [ʒ] with [z]. When followed by the perfective morpheme [-ire] they surface as [s] and [z], respectively. This is dissimilation—the loss of the feature [-anterior] because of the [-anterior] vowel.

(45) [-anterior] dissimilation



<sup>10</sup> With further research into the consonantal phonology of Runyankore, I hope to be able to "unpack" the notion of spirantization.



c. oku[biingwa	'to be driven away'
e[biinj-fr-w-e	'it <sub>9</sub> was driven away'

Hyman (1995) reports a similar phenomenon in Cibemba, a Bantu language spoken in Zambia. In Cibemba, the causative and passive morphemes also appear at the edge of the word, as shown in the data from Hyman in (50). The first column represents the passive form of the stem and the third column, the passive perfective ([ -ile]).

(50)	cít-w-a	'be done'	cít-il-w-e
	fúl-w-a	'be forged'	fúl-il-w-e
	tém-w-a	'be cut'	tém-el-w-e

The causative morpheme [y] behaves the same way. The forms in parentheses in (51) are the phonetic form—the combination of the causative with the perfective results in [š].

(51)	kúm-y-a	'touch'	kum-is-y-e	(kum-iš-e)
	luf-y-a	'lose'	luf-is-y-e	(luf-iš-e)
	lis-y-a	'make cry'	lis-is-y-e	(liš-iš-e)
	saam-y-a	'make sparkle'	saam-is-y-e	(saam-iš-e)

The fact that this effect is found in other Bantu languages supports the notion that there is a specific constraint responsible for the shifting of glides to edge position. Given this, I will employ a constraint aligning a glide with the left edge of the verb.

- (52) ALIGN(GLIDE, RIGHT; WORD, RIGHT)      ALIGN(GL, R)

Of course, as we have seen, this edge-alignment is not absolute. The glide never ends up at the very end of the verb. In general there are no long vocoids at the edge of a word in Runyankore (as well as in other Bantu languages, for evidence of this effect in Kikirewe, see Odden, 1996). For example, a word-internal glide in an onset of a syllable results in a long vowel on the surface, but not if the vowel is final. The first set of words in (53) show the long vowel after a glide. However, if the glide-vowel sequence is word-final, the vowel is never long.

(53) a.	oku[byaama	'to sleep'
	oku[čweera	'to spit'
	oku[myoora	'to twist'
	oku[rwaana	'to fight'
b.	oku[rya	'to eat'
	oku[gwa	'to fall'
	oku[čebwa	'to be mashed'
	oku[reebwa	'to betray'

It is for this reason that no words in Runyankore end in long vowels, glides or diphthongs (which are phonologically long). The prohibition against long vocoids at the edge of the word in Runyankore will assign marks to any of these structures. The constraint is shown in (54).

- (54) \*VV]      No long vocoids (vowels or vowel+glide sequences) at the edge of the word.

The appearance of the glide in the penultimate position on the surface is the result of this constraint being ranked above the constraint requiring the glide to align to the right edge of the word. A vowel-glide sequence within a syllable nucleus is long, violating \*VV]. Moreover, a consonant-glide-vowel sequence should result in a long vowel. Such a vowel would not surface according to \*VV].

(55) \*VV] &gt;&gt; ALIGN(GL, R)

The ranking in (55) is illustrated, along with the constraints SPIRANTIZE and MAX in Tableau 9.

Tableau 9 a [roob - y - ire 's/he wet (something) down'

	*VV-EDGE	AL(GL,R)	CORONAL	MAX
a. a[róób-ize		*		y
b. a[róób-y-ire		***		
c. a[róób-irey	*!			
d. a[róób-izye		*	*!	
e. a[róób-irye		*	*!	

The optimal form in Tableau 9 has the spirantized version of the consonant [r] of the perfective. Because the glide is not visible on the surface in candidate (a), I will assume that the grammar evaluates the ALIGN(GL, R) constraint based also on the effect of the glide (the spirantization of [r]). Candidate (b) fails because the glide is too far from the edge of the verb—it could be closer. Candidate (c) fails because the glide cannot be at the absolute right edge of the word. Finally, candidates (d) and (e) fail because they do not show the spirantization effects, which include deletion of the glide.

Next, I will examine further the role of these constraints in the perfective and a further problem involving sequences of spirantized segments.

#### 4.1.3 Consonant Alternation in the Causative Perfective

As we saw above, the last consonant of a CVC root alternates between the basic and palatalized/spirantized form in the non-perfective, and the perfective form of the stem (from adding [-ire]). The causative shifts from [CVC-y-a] to [CVC-ir-y-e], which surfaces as [CVC-ize] owing to spirantization of [r].

- (56) a. oku[baza ← bar+y+a 'to make count'  
a[bar-ize ← a+bar+ir-y-e 's/he made count'
- b. oku[šáza ← šar+y+a 'to slice with'  
a[šar-ize ← a+šar+ir-y-e 's/he sliced with'
- c. oku[ramutsya ← ramuk+y+a 'to greet'  
a[ramuč-ize ← ramuk+ir-y-e 's/he greeted'
- d. oku[heza ← her+y+a 'to finish (tr.)'  
a[her-ize ← a+her+ir-y-e 's/he finished (tr.)'
- e. okw[iimutsya (like b.) 'to raise up (tr.)'  
a[yimuč-ize 's/he raised up'
- f. okw-ée[taas-y-a 'to intrude'  
ayee[tááh-ize 's/he intruded'

However, the final [r] of the root [bar] fails to surface as [z] despite SPIRANTIZATION. This is also true of the final [s] in the root  $\sqrt{\text{taah}}$ , in (56f). The sound [r] never appears as [z] before the perfective plus causative morpheme combination, [-ize]. The sequences [ziz] and [siz] violate a species of the OCP. I will account for this using a constraint against these sequences: OCP-z. For example, the word in Tableau 10 could

undergo spirantization in both [r]s. However, only the last [r] of the word spirantizes. Compare this with a form exemplified in Tableau 11 in which palatalization and spirantization both take effect (in the optimal parse). Finally, to avoid absolute final placement of the glide we again invoke the constraint that prohibits long vocoids (long vowels and diphthongs) at the edge of a word: \*VV].

Tableau 10 a [bar - y - ire 's/he made count' (3s +  $\sqrt{\text{count}}$  + CAUS + PERF)

	*VV]	AL(GL,R)	OCP-Z	CORONAL	IO-IDENT
a. a[bar-ize		*		*	*
b. a[baz-ize		*	*!		**
c. a[baz-ire		**!*		*	*
d. a[baz-ire-y	*!				

In Tableau 10, we see the ranking of constraints relating to the consonant mutation and glide effects. Candidate (a) is optimal because it satisfies the constraints the best. Candidate (b) fails because the inner [r] is spirantized (satisfying *CORONAL*, but violating OCP-Z). Candidate (c) misaligns the glide—the glide is not aligned closely enough to the right edge of the word. Candidate (d) fails because the glide is too close to the edge of the word. Notice that candidate (a) also has a *CORONAL* violation. This violation occurs because the [r] of the root,  $\sqrt{\text{bar}}$ , is not spirantized. However, this is necessary to avoid violating OCP-Z, as does candidate (b). Compare Tableau 10 with Tableau 11 below.

Tableau 11 a [ramuk- y - ire 's/he greeted'

	*VV]	AL(GL,R)	OCP-Z	CORONAL	IO-IDENT
a. a[ramúč-ize		*			*
b. a[ramúk-ize		*		*!	
c. a[ramúč-ire		**!*		*	
d. a[ramúč-irey	*!				

In this case, the OCP-Z constraint is irrelevant. Candidate (b) fails because the [k] of the root is not coronalized (to obey *CORONAL*). Candidate (c) fails because the glide is misaligned. Candidate (d) fails because the glide is too far to the right, violating \*VV].

## 5 Base-Identity and Input-Identity

Now, we can consider the issue of interest here—the relationship between the base and the reduplicant in instances when there is a causative morpheme [y] present. The important issue under consideration here revolves around the question of reduplicant and base identity. What is the relationship of identity that holds between the reduplicant, the input and the base?

What we find in Runyankore is that the reduplicant tends to resemble the input more closely than the surface form of the base. The data presented thus far tend to obscure this fact owing to the similarity between the input and the base. However, if we consider verb forms exhibiting a large divergence between the input and the base, we will discover that the reduplicant tends to conform more closely to the input while the base diverges from the input. In the reduplicated words in (57) the reduplicant (underlined) resembles more closely the stem of the infinitive—palatalization is not copied from the base.

- (57) a. oku[heeka 'to carry'  
           akáá[heec̣-ire 'he should carry'  
           akáá[heeka-heec̣-ire 'he should carry ...'
- b. oku[bara 'to count'  
           a[baz-ire 's/he counted (yesterday)'  
           a[bará-baz-ire 's/he counted ...'
- c. oku[huuta 'to drink from a bowl'  
           a[húúts-ire 's/he drank from a bowl (yesterday)'  
           a[huutá-huuts-ire 's/he drank from a bowl ...'
- d. oku[jeenda 'to go'  
           a[jeenz-ire 's/he went (yesterday)'  
           a[jeendá-jeenz-ire 's/he went ...'
- e. oku[kwaata 'to catch'  
           a[kwaats-ire 's/he caught (yesterday)'  
           a[kwaatá-kwaats-ire 's/he caught ...'

This basically suggests that the constraint ranking here is such that the phonotactic constraint responsible for selecting palatalized/spirantized forms of consonants (*CORONAL*) must rank above the constraint requiring base-reduplicant identity. Because of this ranking, the base will undergo consonant mutation and need not be completely identical to the reduplicant. The constraint requiring faithfulness of the reduplicant to a base form must rank above the base-reduplicant identity constraints. Because we must compare the reduplicant with the input base, the relevant constraint is a member of the I(nput)-R(eduplicant)-Faithfulness family.

(58) INPUTREDUPLICANT-FAITHFULNESS >> BASEREDUPLICANT-IDENTITY

In other words, it is more important for the reduplicant to resemble the input than it is for the reduplicant to be like the base. This is illustrated in Tableau 12.

Tableau 12 a - RED - jeend - ire 'he went ...'

	IR-FAITH	BR-ID
☞ a. a[jeendá-jeenz-ire		*
b. a[jeenzá-jeenz-ire	*!	

The optimal candidate in Tableau 12 is the one which most closely resembles the input, [jeend]. The spirantizing effects of the perfective morpheme cannot be copied into the reduplicant because of this fact.

Similarly, the constraint requiring the spirantization of the [d] in this word must rank above the constraint requiring base-reduplicant identity. This is illustrated below in Tableau 13, where *CORONAL* ranks above BR-ID.

Tableau 13 a - RED - heek - ire

	CORONAL	BR-ID
☞ a. a[héeka-heec̣-ire		*
b. a[héeka-heck-ire	*!	

The reduplicant in the optimal candidate in Tableau 13 must obey the constraint *CORONAL* despite the fact that the result is a violation of base-reduplicant identity.

The constraints input-reduplicant faithfulness and *CORONAL* must both outrank base reduplicant identity. However, they cannot be ranked with respect to each other as shown by Tableau 14 where the optimal form violates neither.

Tableau 14 a - RED - heck - ire

	IR-FAITH	CORONAL
a. a[ <u>hée</u> ka- <u>heeč</u> -ire		
b. a[ <u>hée</u> ka- <u>heek</u> -ire		*!
c. a[ <u>hée</u> ca- <u>heeč</u> -ire	*!	

These rankings total up to the following.

(59) RED-FORM >> ALIGN-L, ANCH-L, CORONAL, IR-FAITH >> BR-IDENT, BR-MAX

The constraints on reduplicant form and location along with the constraint requiring palatalization (before the appropriate morphemes beginning with the vowel [i]) both outrank the constraints on base-reduplicant faithfulness.

Tableau 15 a[jeend + ire + RED 's/he went ...'

	RED-F	CORONAL	IR-FAITH	BR-ID	BR-MAX
a. a[ <u>jeendá</u> -jeenz-ire				*	-ire
b. a[ <u>jeenzá</u> -jeenz-ire			*		-ire
c. a[ <u>jeendá</u> -jeend-ire		*!			-ire
d. a[ <u>jeendí</u> -jeenz-ire	*!	*			-re
e. a[ <u>jeenzíre</u> -jeenz-ire	*!				

Although candidate (a) violates the constraints on base-reduplicant identity, it satisfies the higher ranked constraints of the reduplicant form, the constraint *CORONAL* and the constraint on input-reduplicant faithfulness. Candidate (b) copies the coronalization features of the base in the reduplicant—satisfying BR-ID. However, IR-FAITH outranks BR-ID. Because the reduplicant has a segment with a feature value different from the input, it incurs a violation here and fails to pass muster. Candidate (c) satisfies both IR-FAITH and BR-ID but fatally fails to show spirantization of the segment [d], failing *CORONAL*. Candidates (d)–(e) all fail immediately owing to their ill-formed reduplicants.

What Tableau 15 tells us is that reduplicant must resist the copying of features that appear in the base caused by the consonant-mutating effects of the vowel [i]. For this reason, the constraint requiring input-reduplicant faithfulness ranked higher than the constraints requiring faithfulness between the reduplicant and the surface form of the base. In a theory of ordered derivational rules, the reduplication would precede any phonological interaction between the high vowel and preceding consonants.

### 5.1 Causative Complexities

The addition of the causative morpheme to the verb creates an additional level of complexity to the relationship between the input and the reduplicant. We would expect, given the result seen above (especially in Tableau 15) to find that the causative morpheme simply appears at the right edge of the word and that there is no copying of it in the redupli-

cant. However, this is not the case. Consider the following reduplicated verbs that also involve the causative morpheme [y] in (60).

- |                              |                             |
|------------------------------|-----------------------------|
| (60) a. oku[taaha            | 'to enter'                  |
| oku[taas-y-a                 | 'to bring in'               |
| oku[taasya-taas-y-a          | 'to bring in ...'           |
| b. oku[hika                  | 'to arrive'                 |
| a[hič-ire                    | 's/he arrived'              |
| a[hiká-hič-ire               | 's/he arrived ...'          |
| c. oku[[hič-a                | 'to cause to arrive'        |
| a[hičá-hič-ize               | 's/he caused to arrive ...' |
| d. oku[guza ← gur+y+a        | 'to sell' ('cause to buy')  |
| a[gur-ize                    | 's/he sold'                 |
| a[guzá-gur-ize               | 's/he sold ...'             |
| e. okw[óoga                  | 'to wash'                   |
| okw[óoz-y-a                  | 'to wash (tr.)'             |
| okw[óozya-yooz-y-a           | 'to wash ... (tr.)'         |
| f. okw[ootsya ← (ok + y + a) | 'to roast, burn'            |
| okw[ootsya-yootysa           | 'to roast ...'              |
| a[yoč-ize                    | 's/he roasted'              |
| a[yotsvá-yoč-ize             | 's/he roasted ...'          |

What is striking about the words in (60) is that the reduplicant appears to copy some features of the surface base that were not copied when the agent of coronalization was the perfective, [-ire]. The behavior of the reduplicant (what features it must copy) is different when the causative is present. In (60a), the glide also appears in the reduplicant. The lack of consonant-glide interaction makes this easier to see. In (60c), the causative causes coronalization of the stem-final consonant. Notice that when the meaning is only 'he arrived ...' the coronalization is not copied to the reduplicant. However, if the meaning is causative, then the reduplicant ends in [č], a coronalized [k]. However, this cannot simply be a case of copying from the base—consider (60b, d, & f). In this case, the reduplicant and the base are different. What can explain this array of differing relationships between the reduplicant and the base?

It is important to note the common element in all of these cases: the causative morpheme /y/. It appears in the reduplicant and in the base. For example, in [a[hičá-hič-ize]] 'he caused to arrive ...' the first [č] is a result of the causative (or some correspondent of it), while the second is a result of the high front vowel at the left edge of the perfective. This must be the case because the causative has induced spirantization of the [r] to [z] in the perfective.

Yet, we know that the reduplicant is not merely a copy of the base (i.e., the surface form of the input) because of the disparity between the reduplicant and the base in the perfective, as in (60d). It appears that there is at least one morpheme, the causative, whose corresponding segment and influence (i.e., spirantization) appears in both the base and the reduplicant, obeying base-reduplicant identity. But, such words as [a[guzá-gur-ize]] 'he sold ...' demonstrate that the copying cannot be just on the surface.

In fact, what we observe from the very first set of data in (60), repeated here as (61) is that what appears in both the reduplicant and the base is the causative morpheme.



- (61) a. oku[taaha 'to enter'  
           oku[taas-y-a 'to bring in'  
           oku[taasya-taas-y-a 'to bring in ...'

This accounts for [a[guzá-gur-ize]] 'he sold ...'. The [z] of the reduplicant is the product of the [r+y] combination of the last consonant of the stem and the correspondent of the causative morpheme.

How does a correspondent of this morpheme appear in two locations that do not correspond positionally? By examining the input to the surface form, it is possible to see how the causative morpheme can be copied into the reduplicant. Assume that the input looks something like (62)

- (62) a + RED + hik + y + ire                      3s+RED+VARRIVE+CAUSATIVE+PERFECTIVE

To best satisfy the MAX-BR constraints, the grammar will try to copy as much out of the base as it can. If this is the case, then it will try to copy [hiky]. In the case of a simple perfective reduplication, the string that is copied from is [hik-ire]. However, the grammar will not copy the moraic element [i] from the perfective affix because that would involve copying an unneeded mora into a slot to be filled with [a]—the final vowel as required by the constraints on REDFORM. But, copying of the glide [y] can be accomplished because the resultant reduplicant, with the addition of the vowel [a] as required by REDFORM, will still satisfy the constraints on reduplicant length.

Consider the inputs in (63). In the perfective, the segments copied into the reduplicant are [hik]. However, when the causative [y] is included the segments that are copied are [hiky].

- |      |                |                         |                                   |
|------|----------------|-------------------------|-----------------------------------|
| (63) |                | <u>Perfective</u>       | <u>Perfective &amp; Causative</u> |
|      | Input          | a + RED + hik + ire     | a + RED + hik + y + ire           |
|      | 'Intermediate' | a + hik-(a) + hik + ire | a + hiky-(a) + hik + ir-y-e       |
|      | Final          | a[hiká-hiçire           | a[hická-hiçire                    |

The intermediate line is not a stage in the derivation—it is simply expository. As one can see, the causative is copied into the reduplicant because it is adjacent to the right edge of the base. This is the case even though the causative 'migrates' to the right edge of the word (i.e., GEN moves it there and this satisfies the constraint ranking). At this point, one might argue that the morphemes in the input are not ordered with respect to one another. Consider what happens if you try this with a verb root that is longer than one syllable.

- (64) a. oku[reen]ez-a 'to wink at, hint'  
           oku[reenga-reen]ez-a 'to wink at, hint ...'  
           a[reen]-çize 's/he hinted'  
           a[reengá-reen]-çize 's/he hinted ...'
- b. oku[ramutsy-a 'to greet'  
       oku[rama-ramutsya 'to greet ...'  
       a[ramuç]-ize 's/he greeted'  
       a[ramá-ramuç]-ize 's/he greeted ...'

In the words in (64) there is a causative morpheme. The evidence for this can clearly be seen in the simple perfective, where the perfective is [-ize], showing the spirantizing effect of [y]. Observe, however, that the reduplicant shows no trace of the causative affix. Notice also that the reduplicant is shorter than the base. The glide is not adjacent to the last consonant copied into the reduplicant, as it was above, in (63).

(65)		<u>Perfective &amp; Causative</u>
	Input	a + RED + ramuk + y + ire
	'Intermediate'	a + <u>ram</u> -(a) + ramuk + ir-y-e
	Final	a[ <u>ramá</u> -ramučize

In (65), the causative is not copied into the reduplicant because it is not adjacent to the last copied segment of the base. An alternative approach involves unordered morphemes in the input. However, this approach requires an alignment constraint that would align the causative [y] with the left edge of the reduplicant if and only if the root in the base were of the form CVC. Another approach would be only to copy the causative if the base were exhaustively copied into the reduplicant. This approach ignores the fact that the perfective morpheme [-ire] can itself be copied into the reduplicant: [a-gwííra-gwiire] 's/he fell ...' in order to satisfy minimality. One should observe at this point that the reduplicant has an ordering condition placed on it in the constraint ranking, as does the causative affix. However, the root, the causative, the perfective and some other morphemes compose the stem—an important functional unit in the Bantu verb in terms of reduplication (Hyman 1990, Downing 1994a, b).

If we assume that there is a type of morphological ordering, if only partial, in the input, then the correct result is available to us from the constraint ranking we have at hand (ignoring for the moment that the constraints *RED FORM*).

Tableau 16 a[gur + y + ire, RED 'he sold ...' (cf. oku[guza 'to sell']

		OCP-Z	CORONAL	IR-FAITH	IO-ID	BR-ID
33	a. a[guzá-gurize		*		*	-ire
	b. a[guṛá-gurize		*	*!	*	-yire
	c. a[guryá-gurize		*!*		*	-ire
	d. a[guzá-guzize	*!			**	-ire

In Tableau 16 we observe how the optimal form matches most closely the input form of the verb. The causative morpheme [y] has a correspondent in both the reduplicant and in the base, but in different locations, subject to the other constraints in the grammar. Candidate (b), which has the closest correspondence between the base and the reduplicant, loses because this violates IR-FAITH, which is ranked above the constraint favoring base-reduplicant identity, BR-ID. IR-FAITH requires the reduplicant to be faithful to the input. Recall from section 5 that the causative morpheme must be ordered with respect to the root and perfective morpheme in the input. IR-FAITH ensures that the reduplicant will try to be as much like the input as possible. This extends to copying of segments (under MAX)—the reduplicant should copy the longest continuous string from the input as it can. This will include the causative morpheme if it is adjacent to the last consonant copied. Full application of palatalization would result in a reduplicant and infinitive that satisfied both BR-ID and IO-ID. However, this results in the sequence [ziz], a violation of OCP-Z, as in candidate (d).

In a form like [a[hičá-hič-ize] 'he caused to arrive ...' the reduplicant receives its palatalizing [y] from the input, which includes the causative. At the same time, palatalization takes place before the [i] of the perfective. Finally, the causative [y] induces spirantization in the perfective morpheme.

Tableau 17 a[hik + ire + RED 'he sold ...' (cf. oku[hicā 'to cause to arrive')

	OCP-Z	COR	IR-FAITH	IO-ID	BR-ID
a a[hicā-hic-ize				*	
b a[hikā-hic-ize			*!		*
c a[hicā-hik-ize		*!			*

In Tableau 17 the optimal candidate satisfies the input-reduplicant faithfulness constraints. Candidate (b) fails to echo the palatalizing segment of the input base. Candidate (c) fails to undergo palatalization in one potential environment. Because the result of palatalization/spirantization is different sounds, OCP-z does not disqualify (a).

## 6 Conclusion

This analysis of reduplication in Runyankore has presented a type of data that might be unfamiliar to many students of Bantu phonology. The appearance of the causative morpheme in non-corresponding positions in the base and the reduplicant has been demonstrated to be a result of constraints on the location of this morpheme. The consonantal mutation effects of the causative glide [y] on the reduplicant appear because the reduplicant must be evaluated with respect to the input, satisfying Input-Reduplicant Faithfulness constraints.

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